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GRADUATE MANAGEMENT PROGRAM ABSTRACTS
OF THESES CLASS 75A

Air Force Institute of Technology
Wright-Patterson Air Force Base, Ohio

January 1975

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AU-AFIT-SL-3-75

**GRADUATE MANAGEMENT PROGRAM
ABSTRACTS OF THESES
CLASS 75A**

**A School of Systems and Logistics AU-AFIT-SL Technical Report
Air University
Air Force Institute of Technology
Wright-Patterson AFB, Ohio**

**By
Department of Research and
Communicative Studies**

January 1975

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This document presents thirty 200 word abstracts on theses written by Class 75A of the Graduate Management Programs, School of Systems and Logistics, Air Force Institute of Technology. The theses report on research related to Air Force and DOD management problems in logistics and facilities management functional areas. Theses may be secured from the Defense Documentation Center and the Defense Logistics Information Exchange. The average thesis is a 100 page formal document completed by a two-man team. The research design approach varies depending on the topic and available data. Each thesis was graded as an academic exercise and is a requirement for the award of a Master's Degree in Logistics Management or Logistics Management with a Procurement Major or Facilities Management.

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FOREWORD

This book contains abstracts of theses submitted to the Graduate Faculty of the School of Systems and Logistics. The theses represented by the abstracts contained in this booklet were submitted by the students of Graduate Logistics Class 75A in partial fulfillment of the requirements for the degree of Master of Science in Logistics Management. These abstracts are distributed to apprise Headquarters USAF, Major Air Commands, and other interested DOD agencies of the results of the student logistics research projects. Thesis Abstracts' Table of Contents is annotated with an A or B classification.

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The student research program has been developed to render the potential benefits of the research as equitable as possible to the many interested DOD agencies while allowing the institution the necessary control over its educational mission. In this manner the Air Force may benefit from research that is a result of and funded for an educational mission.

The primary function of the thesis program is to meet an educational objective. That objective is to provide for integration and application of knowledge offered elsewhere in the curriculum. Therefore, AFIT/SL does not act as a research contract agency. Because of the educational mission and accrediting requirements, the faculty controls both the research topic selection and the eventual thrust of each thesis research effort. Within these limitations, the AFIT/SL policy is to cooperate and provide assistance to any DOD agency seeking aid on a logistics or facilities management related problem.

Potential thesis topics for the School of Systems and Logistics are welcomed from any DOD agency that has identified a logistics or facilities related management problem. Topics may be submitted in two ways. Guidance for submission of the thesis topic proposals is provided by AFR 400-51, 22 July 1974. Research topic proposals are routed through HQ USAF, Logistics Concepts Division (LGXY). Topics are screened at LGXY

and then forwarded to selected organizations. Some of these topics are sent to AFIT/SL. If a more direct route is desired, AFIT/SL "Thesis Research Topic Proposal Forms" will be forwarded upon request. Contact AFIT/SLGR (AUTOVON 78-77011 or 78-77769).



RONALD R. CALKINS, Lt Colonel, USAF
Head, Department of Research and
Communicative Studies
School of Systems and Logistics

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January 1975

SLSR 1-75A

NETWORK MANAGED AIR FORCE PROJECTS

THE ACCURACY OF ESTIMATES AS

A FUNCTION OF TIME

James H. Lowry, Major, USAF
Martin F. Nahlen, Captain, USAF
William M. Peter, Captain, USAF

Recent congressional criticism has emphasized the need for accurate predictions of cost and schedule requirements for developing Air Force weapon systems. Meanwhile, network analysis has been credited with allowing the development of complex weapon systems in the minimum time and at the minimum cost. In an effort to explain this dichotomy, this study is focused on the relationships between the accuracy of activity-time estimates and three factors--the estimate's distance from the activity start date, activity duration, and the estimate's distance from the project start date. Three measures of accuracy were used: the error of the activity-time estimate, the absolute value of this error and the ratio of the activity-time estimate to the activity duration. Multiple regression was used to estimate the relationships among the variables. A data base consisting of estimates made for 381 activities was developed. A tentative relationship was found between accuracy and the proximity of the activity start date, but was dependent on project unique variables. A strong relationship was found between accuracy and activity duration. Methods of improving estimating accuracy in network-managed projects are recommended. 132 pages.

January 1975

SLSR 2-75A

CRITERIA FOR EVALUATING CONTRACTOR MANAGEMENT
POTENTIAL DURING THE SOURCE SELECTION
PROCESS FOR THE ACQUISITION OF MAJOR
WEAPON SYSTEMS

Timothy P. Cormany, Captain, USAF
John P. Donnellan, GS-13, USAF

The purpose of this study was to analyze the proposition that a relationship exists between the managerial capabilities of the civilian contractor and the success of the contract. The proposition was developed through three hypotheses which considered that a relationship exists between project success and the project management teams': (1) educational field of endeavor; (2) educational level, and (3) experience related to the project. To support these hypotheses, nine weapon system contracts and the associated contractors were studied. Data was gathered not only on the contractors' management teams' educational background and experience, but also on the contract history, time schedules, costs, technical performance and contract standard deviations. AFSC, ASD personnel provided most of the information on the contractor management teams as well as contract success data in terms of cost, time, weapon systems performance and reasons for contract deviations. The contract data was evaluated by the authors to create a spectrum of success for the contracts. Nonparametric statistics were used to test the three hypotheses utilizing the management data gathered, and subjective analysis was applied to determine each contract's degree of success. Based on the above, the authors found no relationship between contract success and the management teams' educational background and experience. 109 pages.

January 1975

SLSR 3-75A

AN INVESTIGATION OF NEGATIVE PRE-AWARD SURVEYS
AS AN INDICATOR OF A CONTRACTOR'S INABILITY
TO MEET A DELIVERY SCHEDULE

Jack A. Barnaby, Captain, USAF
Kenneth J. Bohannon, Captain, USAF

The Defense Contract Administration Services (DCAS) has established procedures for evaluating potential contractor capability; this evaluation is called the Pre-Award Survey. One of the primary concerns of the survey involves the ability of the contractor to deliver a quality product within the established parameters of the delivery schedule. But presently one of the major problems involved in the procurement of supplies and equipment for the Government is late deliveries. The purpose of the study was to investigate whether the pre-award survey is an effective indicator of contractor performance. The study explored the delinquency rates of contracts which had both negative and positive pre-award survey recommendations. The results of the study revealed that the delinquency rates for the two recommendations are not significantly different.
93 pages.

January 1975

SLSR 4-75A

THE ACCURACY OF INITIAL ESTIMATING
EFFORTS IN NETWORK MANAGED
AIR FORCE PROJECTS

Paul E. Tyler, Captain, USAF
John F. West III, Captain, USAF

Project managers often use network methods to divide a project into basic activities, estimate the time required for each activity, and then construct a network to show the interrelated sequencing of the activities. The initial estimated activity times provided the basis for financial planning, resource requirements determinations, and the scheduling of resources. The accuracy of the initial estimates is critical to achieving targeted project objectives since these estimates frequently determine resources authorized and committed to the project. Because of the importance of the initial estimates, further research was required to determine how accurate the initial estimates are. This research effort demonstrated that there is a difference between the initial estimates and the actual activity time in Air Force network-managed projects which resulted in optimistic estimates. These results indicate that it may be possible to improve the accuracy of the estimating process in Air Force projects. To do so, estimates should be made by project personnel closely associated with the activities involved. Wherever possible, experienced personnel should be employed to develop these estimates. Designing the network itself to a level of detail such that activity durations approximate four to eight weeks may also contribute to increased accuracy. 79 pages.

January 1975

SLSR 5-75A

A COST ANALYSIS OF THE KT-73 INERTIAL
MEASUREMENT UNIT REPAIR PROCESS USING
GRAPHICAL EVALUATION REVIEW
TECHNIQUE SIMULATION

Alfred Iwersen, Jr., Major, USAF
Richard R. Berry, Captain, USAF
James E. Brawner, Jr., Captain, USAF

In August of 1973 an ongoing relationship was established between the Aerospace Guidance Metrology Center (AGMC) and AFIT/SL to analyze the KT-73 depot level repair process. This thesis initiated an analysis based on primary data from maintenance logs. A new and more accurate model of the flow process was developed and validated. The flow process was then computer modeled using a relatively new application of QGERTS (Graphical Evaluation Review Technique Simulation) which, unlike an earlier Markovian Model used to analyze the KT-73 process accounted for complex nonstructured feedback paths from all stages of the flow process. The QGERTS Model was then used to simulate singular, individual improvements in the flow process. This simulation supported the research hypotheses by showing that critical individual feedback paths and sets of feedback paths in the flow process could, with slight improvement, create considerable savings in the average cost to repair Inertial Measurement Units. 145 pages.

January 1975

SLSR 6-75A

AN EVALUATION OF
THE INTEGRATED MANAGERIAL PROGRAMMING ANALYSIS AND
CONTROL TECHNIQUE SYSTEM OF THE AERONAUTICAL
SYSTEMS DIVISION (AFSC) - A MANAGEMENT
INFORMATION SYSTEM

Wayne R. Boles, Captain, USAF
Allan L. Bowman, Captain, USAF

The Integrated Managerial Programming Analysis and Control Technique (IMPACT) System is a management information system for the management of Government Furnished Aerospace Equipment (GFAE). Interviews with the IMPACT system designers indicated that the system was not being used by GFAE managers as intended. Interviews with IMPACT System users indicated that the system did not provide the degree of flexibility and information needed for management decisions. This study determines the design objectives and the achievements of the IMPACT System. As a tool for evaluation of the system, seven standards were developed from a thorough review of management information system literature. The IMPACT System was evaluated by comparing the design objectives and the achievements to the standards. The authors conclude that the IMPACT System was destined to achieve only limited success because of the failure of the design objectives and the achievements to meet all of the literature standards required for a successful management information system. 92 pages.

January 1975

SLSR 7-75A

EVALUATION OF PROPOSED CRITERIA TO BE USED IN
THE SELECTION OF CANDIDATES FOR RELIABILITY
IMPROVEMENT WARRANTIES

Payton E. Dunn, Jr., Captain, USAF
Andrew W. Oltyan, Captain, USAF

As DOD's percentage of the budget continues to decline, there is an increasing need to get more for the defense dollar. One way to achieve this objective is through the use of Reliability Improvement Warranties (RIW). The RIW calls for a total repair contract based on a pre-determined Mean Time Between Failure (MTBF). The contractor to whom the contract is let can realize increased profits by increasing the MTBF of the item. He does this by initiating "No Cost" Engineering Change Proposals which will increase item performance and reliability. The study was designed to survey the existing population of items covered by a RIW to determine what characteristics they had in common. The results of the study showed that the items covered by existing RIWs: (1) weighed less than 350 lbs, (2) were less than 15 cubic feet, (3) were covered under fixed-price multi-year contracts, (4) initially involved a procurement cost greater than \$100,000.00 and involved more than 100 items, and (5) called for the return of a single component to the contractor. The study also indicated that an elapsed time indicator was useful, administratively, when the contract period was specified in a nominal amount of operating hours. 113 pages.

SLSR 8-75A

MODELS FOR PREDICTING SOLID WASTE GENERATION
AT SELECTED MILITARY FACILITIES
BASED ON FACILITY PARAMETERS

Ronald O. Graf, Major, USAF
William W. Whittenberger, Captain, USAF

One of the major problems in the area of solid waste management faced by the USAF Base Civil Engineer and Headquarters USAF Civil Engineering planners is the disposal of solid wastes at Air Force Installations. In an attempt to resolve this problem, the USAF has contracted for several studies of solid waste operations at various Air Force Installations. The authors of this thesis have taken the data generated through these studies and through other DOD generated studies and developed linear mathematical models using multiple linear regression analysis which could be used to explain the generation of solid wastes at selected military facilities. After testing the models for statistical significance, the authors conclude that a linear relation exists between quantities of solid wastes generated at selected military facilities and the facility parameters associated with those facilities whenever sufficient, valid data can be obtained to adequately describe those facilities. 84 pages.

January 1975

SLSR 9-75A

**FLEXIBILITY IN INFORMATION RETRIEVAL
FOR THE BASE LEVEL MANAGER**

**Joseph A. Coleman, Major, USAF
Harris Keller, Captain, USAF**

Standard (preprogrammed) automated data systems are inflexible in satisfying all of the information needs of base level managers. This inflexibility could be alleviated by the use of information retrieval systems, which are designed to extract specific information from a data base, and output that information in the format specified by the user. There are four retrieval systems currently in use at base level within the Air Force. The diversity in the characteristics of these four systems causes confusion on the part of base level managers. This thesis developed eight characteristics which should be included in each base level retrieval system. These eight characteristics were then compared to each of the four base level retrieval systems to determine the extent that each of the retrieval systems possessed the proposed characteristics. The extent that each of the four retrieval systems possessed the eight characteristics was viewed as the degree of flexibility in information retrieval afforded by a particular retrieval system. 101 pages.

January 1975

SLSR 10-75A

THE AUTHORITY RELATIONSHIPS OF
CONTRACTING OFFICERS
IN A PROJECT/PROGRAM MANAGEMENT ENVIRONMENT

John R. Block, Captain, USAF
Gordon E. Hadlow, Captain, USAF

Over the past several years the position of the contracting officer has become very unclear. The development of program management concepts in the systems acquisition process added a new dimension to this problem. Now he finds himself involved in a conflict of allegiance to two managers--his functional manager and the program manager. This problem of divided allegiance can result in a reduction in his authority in relation to procurement decisions. The objective was to explore the authority relationship of the Air Force procurement contracting officer in the setting of a program management environment. The contracting officer's position was measured as a contrast between his relationship with the program manager and his relationship with the Directorate of Procurement and Production. These relationships of the contracting officer were explored in the program management environments in the system program offices (SPO) of the Aeronautical Systems Division at Wright-Patterson AFB, Ohio. The thesis includes a discussion of the interrelationships of authority, power, and influence. Data was gathered from 50 contracting officers assigned to various SPO organizations. The study revealed a definite correlation in the two relationships. The correlation indicated no difference in the contracting officer's authority relationship with each supervisor/manager. 94 pages.

January 1975

SLSR 11-75A

**THE EFFECT OF SOCIO-ECONOMIC FACTORS
ON MILITARY ENLISTMENTS IN A
ZERO-DRAFT ENVIRONMENT**

**Michael S. Pope, Lieutenant, USN
Robert F. Weideman, Captain, USAF**

Military recruiter assignment locations are currently based upon the population density of seventeen to twenty-one year old males throughout the United States. Several past studies have indicated that other socio-economic factors may have significant effects upon DOD enlistment rates. The purpose of this research was to quantitatively determine if any such relationships exist. The factors considered were unemployment rate, mean education level, per capita income, the number of recruiters, and the percentage of non-whites in the applicable population. The enlistment rate was defined as the total number of applicable age group enlistments divided by the same age group population. Enlistments from Fiscal Year 1974 were selected because that year represents the first no-draft environment since World War II. A stepwise multiple regression model was used to analyze the individual service enlistments and total DOD enlistments. The results of the DOD model indicated that per capita income is the only factor significantly affecting enlistment. The conclusion reached by this research is that DOD cannot rely on socio-economic pressures to induce young males to enlist in the military. The services must focus on making enlistment competitively attractive. 55 pages.

January 1975

SLSR-12-75A

COMPUTER ASSISTED INSTRUCTIONS

IN

SYSTEM RELIABILITY

FOR

LOGISTICS MANAGERS

Walter H. Elbinger, GS-13, USAF
John Keskula, GS-12, USAF

This thesis provides the logistics manager with computer aided instructions in solving reliability problems.

The computer aided instructions cover the following:

RELOG1. RELOG1 calculates the mean time to failure and reliability for constant, linear increasing, and Weibull hazard models.

RELOG2. RELOG2 computes the combinatorial reliability for systems with two to five independent elements and computes the reliability where R out of N elements must survive for success.

RELOG3. RELOG3 computes the mean time to failure for combinatorial systems with identical constant hazard, identical linear increasing hazard, and identical Weibull elements. RELOG3 calculates the mean time to failure where R out of N units must survive for success.

RELOG4. RELOG4 designs redundancy for a series system based either to meet a desired reliability level for the system or cost ceiling. RELOG4 calculates the reliability, mean time to failure, variance, and standard deviation for a standby system with a perfect or imperfect switch.

RELOG5. RELOG5 for a Markov chain determines the state probabilities after a specified number of transitions. RELOG5 provides the transition matrix, the vector of state probabilities, the expected number of visits to each state and costs involved when known. 215 pages.

January 1975

SLSR 13-75A

AN ECONOMIC MODEL TO DETERMINE COSTS WHEN
INTERMEDIATE LEVEL REPAIR USES REMOTELY
LOCATED AUTOMATIC TEST EQUIPMENT

James T. Garrett, Jr., Captain, USAF
Neal W. Gentry, Captain, USAF

Since the 1950's, the Air Force has recognized the advantages and flexibility of repairing items at the base or intermediate level. However, over the past few years the increased complexity and sophistication of modern weapon systems has brought about the advent of complex and expensive automated test equipment. In order to maintain the advantages of intermediate repair, the expensive test equipment had to be procured for and maintained by the individual operating bases; thus producing a very high life cycle cost. In an effort to reduce cost in the face of austere funding, a study was conducted to determine the economic feasibility of centralizing the automatic test equipment. Under this concept, the failure data would be passed via a communication link to a central test center and repair information would be provided to the requesting base. This centralization will provide a higher utilization rate and fewer number of test units; it will also reduce training and centralize test equipment maintenance. If the offsetting costs, communication, for this concept do not override the cost advantages provided above, centralization will produce a cheaper life cycle cost for intermediate repair. The validation of this concept was studied through the use of F-15 data. 104 pages.

January 1975

SLSR-14-75A

A STUDY TO DETERMINE THE ADEQUACY OF THE
TOOLS AND EQUIPMENT USED BY AIR FORCE
WOMEN IN THE CRAFT SKILLS

Philip J. Bolalek, Captain, USAF
Arthur G. Grumblatt, Jr., Captain, USAF

The tools and equipment now used in maintenance, electronics, and civil engineering, were designed to meet the needs of a totally male work force. This study addresses the adequacy of the tools and equipment for the women who are now working in these specialties. The method of approaching this potential problem was to obtain the opinions of the women working in these specialties through self-administered questionnaires. If more than ten percent of the respondents in a specialty considered a tool or equipment item to be inadequate, that item was considered inadequate for women in that specialty. Twenty-four items were identified as inadequate; six of these items were inadequate in more than one specialty. This study also collected data on the age, height, weight, and hand length of the women working in these specialties. In addition to the identification of inadequate tools and equipment for women, this study found that some of these items may also be inadequate for men. Additionally, potential problems were discovered with the quality of tools used in these specialties and with the suitability of women for these specialties. Further study was recommended in all of these areas. 131 pages.

January 1975

SLSR 15-75A

A SIMULATION STUDY OF THE EFFECTS OF
APPLYING VARIABLE SAFETY LEVELS IN
A MEDICAL INVENTORY SYSTEM

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The objective of this thesis was to model the USAF Medical Material Management System and to study the effects of the incorporation of a variable safety level. The variable safety level technique employed was the mean absolute deviation of demands. Due to the complex nature of the study it was decided that this system could best be modeled by using computer simulation. The USAF Medical Material Management System is described and the techniques required to incorporate a variable safety level were outlined. The data used in this study were provided by the USAF Surgeon General's Office. The data were verified before being statistically analyzed to determine the data's most probable statistical distributions and appropriate parameters. The simulation models were constructed using the GASP simulation language. The simulation was developed to model the USAF Medical Material Management System. The simulation was then modified to include the techniques required to incorporate a variable safety level. After the validity of the models was assured, the results were analyzed. Analysis of the results indicated that the incorporation of a variable safety level technique could improve customer service, but would require a significant increase in on-hand stock. 180 pages.

January 1975

SLSR 16-75A

**COST-ESTIMATING RELATIONSHIPS FOR
PREDICTING LIFE-CYCLE COSTS OF INERTIAL
MEASUREMENT UNIT MAINTENANCE**

**Lynn M. Lynch, Lieutenant, USN
Neil V. Raymond, Captain, USAF**

A major problem to life cycle cost planners is the scarcity of tools available for use in the conceptual phase of system design and acquisition that accurately predict operational and support costs. This thesis developed a cost-estimating relationship (CER) that predicts maintenance costs of inertial measurement units (IMUs) using only design and policy data that would be available to planners in the conceptual phase of weapon system acquisition. The cost estimated is the average quarterly maintenance cost per aircraft. The estimating variables are selected based on two criteria: (a) Is the variable one that, viewed logically, would affect maintenance costs, (b) Is the variable one that would be known to planners in the conceptual phase of weapon system acquisition? The CER was developed by the ordinary least squares method of multiple regression analysis. The data used for the estimating variables in the regression analysis was extracted from empirical data on ten aircraft IMUs in the Air Force inventory in fiscal years 1973 and 1974. The CER was cross-validated against data not used to develop the model and the CER predicted within 0.6 standard errors of the estimate. (82 pages.)

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SLSR 17-75A

A SIMULATION OF THE EMERGENCY CLINIC
AND DEPARTMENT OF PRIMARY CARE AT THE
WRIGHT-PATTERSON AFB MEDICAL CENTER

Theodore L. Brown, Major, USAF
Donald R. Dyer, GS-12

This thesis concerns the development of a computer simulation model of the Emergency Clinic and the Department of Primary Care of the Wright-Patterson AFB Medical Center in search of a way to reduce patient waiting time. The authors determined that by revising medical personnel work schedules and by implementing a telephone scheduling system for patients, waiting time could be reduced considerably.

January 1975

SLSR 18-75A

A COMPUTER SIMULATION OF RELEASE PARAMETER
EFFECTS UPON BOMB IMPACT DISTRIBUTIONS

William G. Berry, Jr., Captain, USAF
Leon W. Laugginger, Captain, USAF

This study investigates the validity of an assumption used by the military services in their operational and logistical planning efforts. The assumption is that bomb impacts around a target follow a bivariate normal distribution. The authors formulated a FORTRAN based computer simulation model capable of accurately predicting bomb impacts around a target. The model is also capable of accepting various types of error distributions, or any combination thereof, in bomb release altitude, true airspeed, pitch, and heading. The model then predicts the bomb impact points and their resultant distribution around a target. The adaptability of the model thus enables it to be used in comparing theoretical distributions against actual impact distributions. In this study release errors were made to follow normal distributions and the resultant impact distributions were analyzed. The statistically supported results suggest that if release errors follow a normal distribution, then the resultant impact distribution will be bivariate normal only for certain conditions. The results further suggest that if the release errors do not follow a normal distribution, then the resultant impact distribution will not be bivariate normal. 172 pages.

January 1975

SLSR 19-75A

AN EVALUATION OF HEURISTIC SCHEDULING
RULES BY USING A ZERO-ONE LINEAR
PROGRAMMING APPROACH

Doan Minh, Colonel, VNAF

This study attempted to find some heuristic scheduling rules that would consistently generate good schedules in military aircraft maintenance environments. Heuristic rules considered were those commonly used in the military aircraft field or frequently mentioned in scheduling literature. There was no attempt to study heuristic rules exhaustively. To test heuristic rules, ten aircraft maintenance "scenarios" were created, based on data collected from the 17th Bombardment Wing (SAC). Constraints imposed in these scenarios were: limited resources; precedence relations between jobs; project and job due dates; and concurrent and non-concurrent job performance requirements. Each maintenance scenario was modeled, using a zero-one linear programming formulation developed by Alan B. Pritsker, *et al.* and published in a RAND report. By use of an existing computer code to solve this formulation, the optimum solution of each scenario was found. This optimum solution was used as standard for a comparison of solutions given by different heuristic rules tested. Final analysis of results disqualified the heuristic rule "shortest job first;" also indicated that all the other rules tested may be considered as good rules (criterion for "good" rule was arbitrarily set); and not any rule tested is distinctly and consistently superior to other such rules. 138 pages.

January 1975

SISR 20-75A

A GASP IV SIMULATION OF TACTICAL AIR
INTERDICTION USING A CHOICE OF
WEAPON LOADS AND CONTINUOUSLY
CHANGING WEATHER CONDITIONS

Ronald G. Bailey, Captain, USAF
Joseph R. Szwarc, Captain, USAF

The thesis simulates tactical air strike missions with a choice between unguided and laser-guided weapons. Weather at target point is known at a time prior to strike aircraft arrival. The simulation has a choice of three load decision rules: always load conventional, always load guided, or load aircraft with unguided versus guided bombs based on probability tables, using Markov chain principles, to estimate weather over target at n hours. Weather probability tables will dictate type of munition loaded. The actual weather at target is simulated using GASP IV, a computer language which allows continuous event simulation. GASP IV is used to simulate weather fronts moving toward target(s). The speed and distance between fronts is based on historical weather data. GASP IV changes the weather conditions at the target as a front moves over it. Strike results are based on actual weather, type of bomb loads, and the air defense at target. Values for the choice/type of tactics used, number of aircraft, target defenses, number and location of targets and success factors by type of munitions are inserted as data for the basic program, as are the number, speed, type, and direction of the weather fronts. 160 pages.

January 1975

SLSR 21-75A

AN INVESTIGATION OF A PROPOSED
AUCTION TECHNIQUE AS A METHOD OF PROCUREMENT

Willie J. Freeman, Jr., Major, USAF
Robert G. Welbaum, Captain, USAF

The Department of Defense procurement system has not always been effective in establishing a reasonable price. This thesis' purpose was to investigate an Auction Technique as an alternative procurement method. Formal Advertising was used for comparison purposes. Four tests were made: (1) determine the reliability of both procurement methods by comparing the results of a hypothetical procurement to a predictive model, (2) determine which procurement method would result in the lowest price, (3) investigate how bids would change when the expectation of future business changed, and (4) determine the difference between the lowest bid and the second lowest bid for each procurement method. Data were obtained from a controlled experiment using students from the Air Force Institute of Technology. The data gathering instrument was a scenario of a hypothetical procurement based upon microeconomic theory. Results indicated that the model was not able to predict the results of the procurement because it was not an accurate indicator of reliability and the scenario was too complex. The Auction Technique produced the lowest price and the smallest difference between the lowest bids and the second lowest bids. Also, the bids increased as the expectation of future business increased for both procurement methods. 141 pages.

January 1975

SLSR 23-75A

THE POTENTIAL OF AN 8 x 8 x 5 FT.
INTERMODAL CONTAINER AS A UNITIZATION
MEDIUM FOR ROUTINE MILITARY AIR CARGO

Michael M. Rice, Captain, USAF
Dennis E. Welch, Captain, USA

This study addressed one of the factors which affect the use of intermodal containers for air cargo shipments; the relationship between the size and quantity of the air cargo to be shipped and the size of the intermodal container. The cargo data used in the study was extracted from records of air shipments from Dover AFB, Delaware to Rhein Main and Ramstein AFBs for the third quarter of FY 1974. The container used in the study was a proposed 8 ft. x 8 ft. x 5 ft. intermodal QUADCON container. The overseas transportation network used in the study consisted of one CONUS APOE, one overseas APOD, and nine cargo break-bulk point destinations. Several computer programs and a GE 600 series computer were used to manipulate the cargo data. The authors conclude that the QUADCON container would hold at least 76.09 percent of cargo pieces, weight, or cubic volume. However, the container would not have been fully utilized if the cargo had been containerized and shipped on the actual dates reflected in the cargo records. The authors conclude that substantial improvement in container utilization could have been achieved by holding cargo one additional day for aggregation at the CONUS consolidation point. 222 pages.

January 1975

SLSR 24-75A

AN ANALYSIS OF THE EFFECTIVENESS OF ASPR IN PROVIDING
GUIDANCE FOR THE UTILIZATION OF GOVERNMENT-OWNED
INDUSTRIAL PLANT EQUIPMENT

Joseph A. Insley, Captain, USAF
Ronald T. McBride, Captain, USAF

The control of Industrial Plant Equipment (IPE) is an integral part of Government Property Administration. The Department of Defense tends to weaken the efficient management of Government-owned IPE in the possession of its contractors by failing to establish stricter standards for IPE utilization. Although Appendix B of the Armed Services Procurement Regulation (ASPR) contains guidance for the development of utilization procedures, it tends to be somewhat vague and subject to interpretation by both Government Property Administrators and contractors alike. The authors analyzed twenty-five approved utilization procedures and evaluated the content of these procedures against the requirements of ASPR Appendix B-603.1. They concluded that the present ASPR requirements are inadequate to provide the management control necessary to insure that IPE in the possession of contractors is properly utilized or declared excess when no longer required in support of a contract. They also contend that some utilization procedures in being do not meet the minimum requirements of ASPR. The authors recommend changes to the ASPR that will provide greater visibility into the use of IPE. 73 pages.

January 1975

SLSR 25-75A

**A LINEAR ASSIGNMENT MODEL FOR PREDICTING THE
ASSIGNMENT PREFERENCES OF AIR FORCE CIVIL
ENGINEERING OFFICERS**

**Major John C. Nicholson
Captain Robert T. Williams**

The present USAF officer assignment system allows an individual to input his top choices of job level, location, and desired duty. Should the top choices be unavailable when the individual is due for assignment, the actual choice of the assignment is made by assignment personnel who no longer have the benefit of the individual's input. This research studied 59 Air Force Civil Engineering officers to determine if their assignment preferences could be predicted using a mathematical model. Data reflecting the relative preferences an individual held for various factors which make up assignments was run through the model to determine if the model could successfully select from ten test assignments the same assignments which the individual would select himself. The research included a variation of the matched pair comparison format for data collection, the development and use of a computer driven linear assignment model, and correlation analysis of the results. The results supported conclusions to further experiment with the model. 132 pages.

January 1975

SLSR 26-75A

A COMPUTER PROGRAM FOR EVALUATION OF
SOLID WASTE RESOURCE RECOVERY

Allan K. Bean, Captain, USAF
Lee E. Schmidt, Captain, USAF

Resource recovery is a method for reducing solid waste disposal problems resulting from increasing rates of solid waste generation, dwindling landfill disposal sites, depletion of natural resources, and public concern about ecology and waste. There appeared not to be a systematic method for evaluating facility designs for processing and recovering resources from solid wastes. This thesis presents such a method. Values for parameters of three populations--solid waste composition, recovered resources market, and resource recovery equipment--were developed based on review of the literature. A FORTRAN Y computer program for use on the CREATE computer system was developed, tested, and used to determine the net annual cost of twelve facility designs built into the program. Options are available in the program for adding additional designs. Sensitivity of cost for changes in solid waste composition, market prices, and annual tons processed was evaluated. Major conclusions are USAF bases alone do not appear to generate sufficient solid waste to yield a profit from operation of a resource recovery facility, various facility designs could be profitable on a regional scale which generates larger quantities of solid waste, and data in the literature on equipment for resource recovery from solid wastes needs improvement. 219 pages.

January 1975

SLSR 28-75A

RF-4 COPRODUCTION: UNITED STATES
AND FEDERAL REPUBLIC OF GERMANY

Arnold M. Berry, Captain, USAF
Edward A. Petersen, Captain, USAF

This thesis is an analytical history of a particular Foreign Military Sales case between the US and the Federal Republic of Germany. The elements of the case, an aircraft sales case, a coproduction agreement, and a logistics support program are examined in detail; but the coproduction agreement constitutes the principal effort. The US Government was committed to use its best effort with the US companies associated with the RF-4 to place up to \$125M worth of subcontracts with German aerospace industries; however, this commitment was contingent upon the procurement of 88 RF-4E aircraft by the FRG. The implementation of the coproduction agreement by the US Project Office and the actions of US and German industries to produce RF-4E jet aircraft are interwoven in a chronological narrative, which covers the 1967 - 1974 time frame. 125 pages.

January 1975

SISR #29-75A

A CASE HISTORY OF THE COPRODUCTION OF
THE F-5E AIRCRAFT BY
THE UNITED STATES OF AMERICA AND THE REPUBLIC OF CHINA

John M. Banas, Commander, SC, USN
James R. Reid, Major, USAF

Coproduction of weapons systems is an integral part of security assistance programs. The authors forecast that the growth currently being experienced in foreign military sales will be shared by coproduction. In 1975, foreign-owned U.S. built military aircraft exceeded the number of aircraft in the USAF inventory. In accordance with U.S. policy these aircraft will be supported by DOD/USAF logistics systems. To be effective in logistics support of these aircraft, DOD logistics managers will require background knowledge on the origins and development of current coproduction programs. This thesis provides a descriptive study of the origins, agreements, management systems, and problems encountered in the ROC F-5E coproduction program. In 1973 the U.S. and the ROC entered into a coproduction agreement to coproduce F-5E aircraft. Negotiations had culminated in agreements and contracts fixing division of labor and responsibility for specific tasks. Problems and policies grew out of the actual coproduction process. These areas, together with considerations on the economic impact of coproduction, have been researched and are detailed in this thesis. The authors conclude that the coproduction should not be emphasized as a primary means of strengthening the armed forces of friendly foreign countries, but will be a necessary means. 119 pages.

January 1975

SLSR 30-75A

ECONOMIC ANALYSIS AND NEW STARTS OF FEDERAL GOVERNMENT

COMMERCIAL OR INDUSTRIAL ACTIVITIES

William M. Duke, Captain, USAF

Paul E. Lang, Captain, USAF

The Executive Branch of the United States Government has stated that the Government will rely upon the private enterprise system to provide the goods and services it needs except in specific instances where reliance upon private enterprise would not be in the national interest. One such instance occurs when procurement of goods or services would be more costly than government production of them through the operation of commercial or industrial activities. No published evidence exists which indicates that the techniques prescribed by the Federal Government properly evaluate alternative proposals to procure the goods and services it requires or produce them through "new starts" of commercial or industrial activities. The authors demonstrate that proposals to procure goods and services or produce them by means of "new starts" are alternate long-term capital budgeting proposals which should be evaluated on the basis of future costs and benefits, the time value of money, and quantitative analysis of risk. The authors conclude that the techniques prescribed by the Federal Government do not meet these criteria and, therefore, do not properly evaluate alternative proposals involved in "new start" capital budgeting decisions. 128 pages.

January 1975

SLSR 31-75A

AN EVALUATION OF THE MAJOR QUALIFICATIONS
DESIRED OF AIR FORCE SYSTEM PROGRAM
MANAGERS

Ralph E. Smythe, Major, USAF
William J. McMullan, Captain, USAF

The Air Force places a great deal of emphasis on the proper selection of system program managers for its multi-million dollar programs. There is an assumption that there is no difference in the desired qualifications of a system program manager over the program acquisition life cycle (conceptual, validation, full scale development, production, and deployment phases). This assumption is largely unsubstantiated in the literature. This study conducted an exploratory evaluation on the education, experience, and managerial trait qualifications desired of program managers over the program life cycle. Interviews were conducted with the present system program managers of major Air Force programs to obtain data bearing on the relationship of the desired qualifications between the individual stages. The authors concluded from an analysis of the data that there is a difference in education and experience, but not of managerial trait qualifications desired of system program managers between the conceptual/validation phase and the full scale development/production/deployment phase. The research results showed that the primary difference lies in the fact that an engineering background (education and experience) is preferred in the initial stage of a program, but shifts to a management background (education and experience) in the latter stages. 93 pages.

January 1975

SLSR 32-75A

A METHODOLOGY FOR CONSTRUCTING
A COST OF PURCHASED
MATERIALS INDEX

Joel Manary, Captain, USAF
Lawrence Staub, GS-13

Conventional price analyses as applied to large dollar purchases (\$10,000 and over) are generally not considered to be economically feasible over the full range of small purchases (less than \$10,000) where an abundance of such purchases must be processed on a continuous basis. Search for an easy-to-use technique which buyers engaged in small dollar purchasing could economically use on a day-to-day basis led to the consideration of cost indexes as a solution. Small dollar purchasing history for a single Federal Supply Class was used to construct an index similar to the familiar Consumers Price Index but with the last full month being the base period to which all previous months are compared. Statistical tests show that the index constructed is consistent but does not warrant the required level of confidence. The authors feel that the procedure developed is logical and potentially useful, if not in the strict sense of the word proven to be statistically sound. There remains certain reservations concerning the preciseness with which the sampled data estimates the actual price trends. This reservation becomes relevant if the observed price data is to be used for prediction or forecasting purposes. 117 pages.